



Forest Health Protection Pacific Southwest Region

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To: Forest Supervisors (Eldorado, Inyo, Lassen, Modoc, Plumas, Sierra, Stanislaus, Sequoia and Tahoe National Forests and the Lake Tahoe Basin Management Unit), Park Superintendents (Sequoia Kings Canyon and Yosemite National Parks), Field Managers (Bureau of Land Management, Eagle Lake and Alturas Field Offices), and Deputy Director (CAL FIRE Resource Management)

Subject: Douglas-fir Tussock Moth Outbreak Status and Results of 2014 Pheromone Detection Survey (FHP Report NE15-01)

Enclosed are the results of the 2014 cooperative Douglas-fir tussock moth (DFTM) pheromone detection survey (Table 1). Participation in this effort includes the US Forest Service, CAL FIRE, Bureau of Land Management and the National Park Service.

Douglas-fir tussock moth outbreaks occurred on the Lassen and Plumas National Forests in 2014 but populations are expected to decline in 2015

- Light to severe defoliation of white fir was observed on ~28,000 acres on the Plumas and Lassen National Forests and adjacent private timberland (Figures 1 & 2).
- Most of the outbreak area was considered light to moderate defoliation with ~1,500 acres of severe defoliation.
- The public reported several cases of allergic reactions to DFTM caterpillar hairs in infested recreation areas.
- Fall egg mass surveys indicated that populations are declining in most areas. However, high trap catches in some locations indicate a potential for defoliation in 2015.
- DFTM adult trap catches were very high in some Lassen, Plumas and Tahoe National Forest locations.
- DFTM adult trap catches were low on all other reporting Region 5 National Forests.
- Treatment options exist to control DFTM populations or to protect high-value sites and trees (Appendix A).
- Forest Health Protection and CAL FIRE Pest Management staffs are available to provide





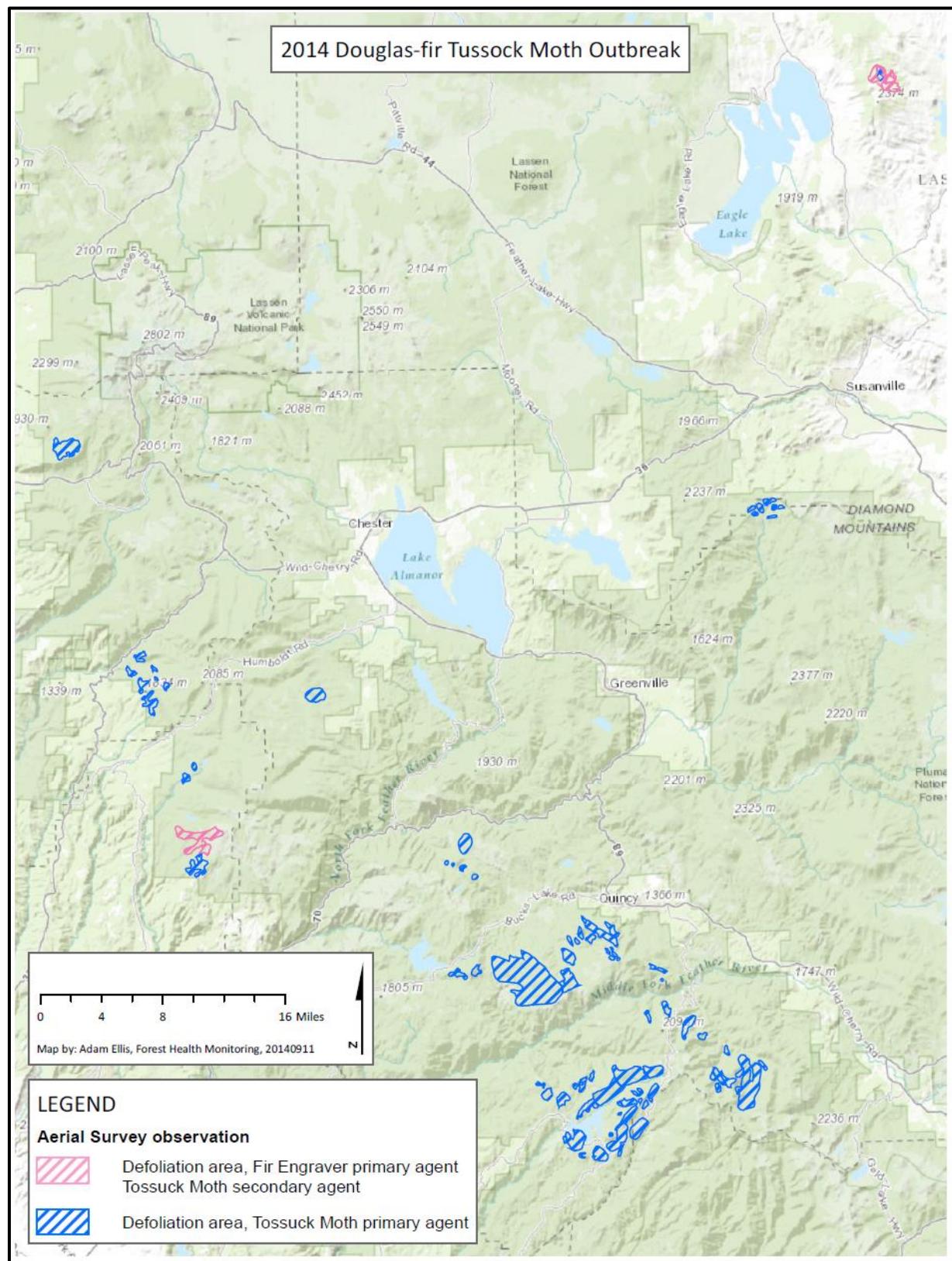
Figure 1. White fir defoliated by Douglas-fir tussock moth, Plumas National Forest

Traps were installed in 162 plots this year with 80% reporting. 17% of plots averaged > 25 male moths per trap. A greater than 25 per trap average is considered high and follow up egg mass and/or larval density surveys are conducted on these plots to determine the potential for defoliation in the coming year. The 22 high count plots in 2014 were located on the Lassen NF (9 plots), Tahoe NF (7 plots), Plumas NF (2 plots) Modoc NF (1 plot) and 3 plots on private timberland in northeastern California (monitored by CAL FIRE). Forest Health Protection and CAL FIRE personnel have already conducted egg mass surveys at select locations and will conduct larval surveys in late spring/early summer for the remaining plots. The results of the egg mass surveys on the Lassen and Plumas National Forests indicated a declining population with a low potential for defoliation in 2015.

High DFTM adult trap catches reveal several areas on the Lassen and Tahoe National Forests that have the potential for defoliation in 2015. These areas are not part of the current outbreak. Forest Health Protection and/or CAL FIRE Pest Management staff will conduct additional monitoring and report any defoliation to the appropriate land managers. Field going personnel are urged to continue to check for evidence of feeding and defoliation on white fir this coming summer and fall and report any findings to your local forest health contacts (Appendix B).

Trapping materials have been ordered for the detection survey plots for 2015 and will be distributed to cooperators in June or July. Updates on population monitoring will be distributed to land managers as needed.

Figure 2. Mapped DFTM-caused defoliation on the Lassen and Plumas National Forests



Forest Health Protection appreciates the continued cooperation from all agencies in this ongoing west-wide survey effort and especially thanks the following DFTM Detection Survey cooperators:

Don Owen, CAL FIRE, Redding
Tom Smith, CAL FIRE, Davis
Jim Kral, CAL FIRE, Mountain Home DSF
David Shy, CAL FIRE, Tulare
Frank Spandler, CALFIRE Tulare
Tom Warner, NPS, Sequoia Kings Canyon
Brian Mattos, NPS, Yosemite
Cliff Mothermal, BLM, Susanville
Peter Hall, BLM, Alturas
Ryan Tompkins, Plumas NF
Cathy Carlock, Modoc NF
Barbara Bryan, Modoc NF
Susan Wilcox, Lassen NF
Sandy Tiffin, Lassen NF
Sandy Osman, Lassen NF
Paul White, Lassen NF
Gary Cline, Tahoe NF
Kelly Hack, Tahoe NF

Teri Banka, Tahoe NF
James Ingram, Eldorado NF
Jeff Griffin, Eldorado NF
Bob Carroll, Eldorado NF
Dana Walsh, Eldorado NF
Eileen Carlen, Stanislaus NF
Kathy Stillwell, Stanislaus NF
David Vosti, Stanislaus NF
Maria Benech, Stanislaus NF
Francey Blaugrund, Sierra NF
Dave Smith, Sierra NF
George Powell, Sequoia NF
John Springer, Sequoia NF
Andrew Weinhart, Inyo NF
Scott Kusumoto, Inyo NF
Rita Mustatia, LTBMU
Paul Guarnaccia, LTBMU

If you have any questions regarding this report and/or need additional site specific information please contact Danny Cluck at 530-252-6431.

/s/ *Danny Cluck*

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Forest Entomologist
NE CA Shared Service Area

cc: Forest Health Protection, Regional Office
 Beverly Bulaon, Stanislaus NF

Table 1. Number of Douglas-fir tussock moth pheromone detection survey plots by trap catch for 1997 - 2014 for California.

Year	# of plots reported/ % reported	NUMBER OF PLOTS WITH AN AVERAGE MOTH CATCH PER TRAP OF:													
		0<10	10<20	20<25	25<30	30<35	35<40	40<45	45<50	50<55	55<60	60<65	65<70	70<75	75+
1997	142	88	27	10	9	4	3	0	0	1	0	0	0	0	0
	100%	62%	19%	7%	6%	3%	2%			<1%					
1998	159	81	22	11	9	6	3	10	7	5	2	1	1	1	0
	100%	51%	14%	7%	6%	3%	2%	6%	4%	3%	<1%	<1%	<1%	<1%	
1999	159	126	20	5	3	2	2	0	0	0	1	0	0	0	0
	100%	79%	13%	3%	2%	1%	1%				1%				
2000	185	154	15	4	4	0	1	2	2	2	0	0	1	0	0
	100%	83%	8%	2%	2%		<1%	1%	1%	1%			<1%		
2001	183	95	57	13	10	6	0	1	1	0	0	0	0	0	0
	100%	52%	31%	7%	5%	3%		<1%	<1%						
2002	168	126	31	5	3	3	0	0	0	0	0	0	0	0	0
	100%	75%	18%	3%	2%	2%									
2003	163	53	42	11	11	10	14	13	3	1	4	0	1	0	0
	100%	32%	26%	7%	7%	6%	8%	8%	2%	1%	2%		1%		
2004	174	68	43	6	16	11	6	5	3	0	2	1	1	0	0
	* 93%	39%	25%	3%	9%	6%	3%	3%	2%		1%	<1%	<1%		
2005	195	139	15	11	7	4	3	2	3	1	0	0	0	1	1
	*95%	71%	8%	5%	4%	2%	2%	1%	2%	<1%			<1%	<1%	
2006	164	98	26	8	8	5	3	4	3	4	2	0	1	1	1
	100%	60%	16%	5%	5%	3%	2%	2%	2%	2%	2%		<1%	<1%	<1%
2007	164	157	6	0	0	1	0	0	0	0	0	0	0	0	0
	100%	96%	4%		<1%										
2008	155	155	0	0	0	0	0	0	0	0	0	0	0	0	0
	100%	100%													
2009	147	144	3	0	0	0	0	0	0	0	0	0	0	0	0
	*93%	98%	2%												
2010	142	134	6	2	0	0	0	0	0	0	0	0	0	0	0
	*90%	95%	4%	1%											
2011	146	100	23	5	7	5	2	2	1	2	1	0	0	0	0
	*90%	68%	16%	3%	5%	3%	1%	1%	<1%	1%	<1%				
2012	133	76	18	5	7	4	7	3	4	4	4	1	1	0	0
	*82%	57%	14%	4%	5%	3%	5%	2%	3%	3%	3%	<1%	<1%		
2013	137	79	14	6	5	5	4	6	5	2	4	1	2	1	3
	*78%	58%	10%	4%	4%	4%	3%	4%	4%	2%	3%	<1%	2%	<1%	2%
2014	130	86	14	8	5	7	1	0	1	2	2	1	2	1	0
	*80%	66%	11%	6%	4%	5%	<1%		<1%	2%	2%	<1%	2%	<1%	

*some traps not counted due to weather or plots were burned in recent fires

Appendix A: Douglas-fir Tussock Moth Biology and Management

The Douglas-fir tussock moth (DFTM), *Orgyia pseudotsugata*, is an important defoliator of white fir in California. Outbreaks of the native insect occur somewhere in the state about every 10 years. These outbreaks arise abruptly, but generally subside within one to two years. White fir is the primary host, but other tree species may be defoliated during outbreaks. Defoliation by DFTM may weaken, kill, or top-kill trees. Heavily defoliated trees may experience reduced growth for several years post outbreak and be more susceptible to attacks by bark beetles. Ninety percent of mortality occurs in trees that are $\geq 90\%$ defoliated, while trees with $\leq 50\%$ defoliation rarely die. Top-kill follows a similar trend.

Defoliation first appears in late spring. Larvae from newly-hatched eggs feed on current year's foliage, causing it to shrivel and turn brown. Older larvae may feed on both current and old foliage, although current needles are preferred. Defoliation occurs first in the tops of the trees and the outermost portions of the branches, and then in the lower crown and farther back on the branches.

The adult male is a gray-brown to black-brown moth with feathery antennae and a wingspread of 1 to 1 1/4 inches. The forewings are gray brown and have two distinct, irregular dark bars and two vague whitish spots. The hindwings are a contrasting brown. The female has tiny rudimentary wings, small threadlike antennae, and a large abdomen. Young larvae are 1/8 to 1/4 inch long and have long, fine body hairs which later develop into tufts. Mature larvae are up to 1 1/4 inches long and very colorful. Two long, dark tufts or pencils of hair similar to horns are located right behind the head.

Four dense, buff colored tussocks are located forward along the middle of the back. The rest of the body except for the legs and head is covered with short hairs radiating from red, button like centers (see photo).



Douglas-fir tussock moth larvae (differences in color and size are due to stage of development).

The DFTM produces one generation per year. Females mate soon after they emerge from their pupal cocoon. Eggs hatch in early June, coincident with bud break and shoot elongation of host trees. The larvae pass through four to six instars and pupate toward the end of the July. The pupal stage lasts from 10-18 days depending on temperature.

Natural controls keep DFTM populations low most of the time. There is some indication that fir growing on pine sites and fir stands located on warm, dry sites are most susceptible to damage. In these forest situations, silvicultural treatments that reduce the number of susceptible hosts and decrease the multi-storied characteristics of host stands are recommended to prevent outbreaks.

When population levels are high enough to cause unacceptable damage, methods of direct control are available. The viral insecticide, TM-Biocontrol-1, is currently registered in California for use against DFTM. Other registered insecticides are also effective against DFTM including broad spectrum insecticides and more targeted growth regulators and microbial insecticides. Applications of insecticides are made aerially over large areas or with ground based equipment on individual trees. Where DFTM-caused defoliation is expected in high value areas, such as recreation areas or on individual high-value trees, pesticide use may be warranted to minimize tree mortality and reduce public exposure to the insect.

Public Health Concerns

The hairs on the caterpillars as well as their egg masses and cocoons may cause allergic reactions in some people. Itching is the most common complaint, but adverse health effects can include rashes (with welts or blisters), watery eyes, runny nose, cough and, less commonly, shortness of breath, wheezing, and chest tightness. Hot weather and perspiration increase the severity of symptoms, and people with a history of allergies may be more susceptible to "tussockosis." Accidental disturbance or handling of old larval skins and spent cocoons, deposited under leaf litter, bark, wood piles, timber, or any other material that caterpillars have touched, can result in irritation. Irritation intensity depends upon the amount of contact with the caterpillar and the sensitivity of the person. The effects may be cumulative, with successive exposures resulting in elevated symptoms. During a 1998 outbreak at Grant Grove in Kings Canyon National Park, approximately 100 people sought medical attention or advice, resulting in a temporary closure of the area for health and safety reasons.

Additional information on DFTM:

“White fir recovery following Douglas-fir tussock moth Bear Mountain outbreak” found at <http://caforestpestcouncil.org/resources/>

Forest Insect and Disease Leaflet 86: <http://www.na.fs.fed.us/spfo/pubs/fidls/tussock/fidl-tuss.htm>

Appendix B: Forest Health Contacts

Region 5, Forest Health Protection, Service Area Contacts

Northern CA (National Forests: Klamath, Mendocino, Shasta-Trinity, Six Rivers)

Plant Pathologist: Pete Angwin
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